

THE BOTANICAL ASPECT OF MAINE'S CRITICAL AREAS PROGRAM

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Since 1974 the State of Maine has taken an active role in the conservation of rare plant species through its Critical Areas Program. Efforts to identify significant natural areas began in 1971 when Maine participated in the New England Natural Areas Program. This program identified 474 botanical areas in New England, including 157 areas in Maine, and its report recommended that the state continue the natural areas inventory (Hartman, 1972). The Natural Resources Council of Maine and the State Planning Office drafted legislation for a Maine natural areas program. The natural areas bill was defeated in the 1973 regular session, but passed in the special session of 1974 as the Critical Areas Act. The title "Critical Areas" was assigned to the natural areas program so that its name would conform to the name of proposed federal legislation which was never passed.

Under the Critical Areas Act of 1974, the State Planning Office has been working actively on the conservation of Maine's rare plant species. In the absence of a State rare and endangered species law for plants, Maine has been able to accomplish a significant amount of work to protect rare plants with its natural areas program.

APPROACH

Maine's Critical Areas Act directs that a state-wide inventory be conducted for rare and unusual plant species that are worthy of preservation, and that an official listing of the significant areas be compiled. Further, the Act directs that the State Planning Office coordinate the conservation of "critical areas". The focus of the Act is to collect natural resource data to be used by planners, conservationists, and landowners.

Being essentially non-regulatory, the program uses non-traditional land conservation techniques for rare plant protection. Knowledge of the location of rare plants is essential for providing protection and the program has, therefore, emphasized the identification of critical areas. Ignorance of the exact location of the rare species has been the main destructive threat. Uninformed landowners have, in many cases, destroyed significant stations without realizing what they were doing.

Most of the landowners are unaware of the rare plants on their property and are also unaware of the plants' significance. In most cases government agencies as well are unaware of rare plants on lands they manage. For example, Maine's only station for *Ilex glabra* (Inkberry) was relocated just within the boundary of Acadia National Park, and the three significant stations for *Triphora trianthophora* (Nodding Pogonia) were located within the Evans Notch unit of the White Mountain National Forest.

Because most Maine land is privately owned, the private sector has a major role in protecting rare plants. The program recognizes that the landowner is in a key position to insure the safety of the plants. Since there are no regulatory laws protecting rare plant critical areas, the program depends upon the cooperation and good will of the landowner. One of the fundamental approaches, to which the program devotes a considerable amount of time, is to inform the landowner fully of the significance and location of the rare plant areas. This method has worked very well; most people are receptive to the information and supportive towards rare plant protection. There are few instances where the areas are directly threatened by destruction. Thus, we feel that we have achieved a major conservation accomplishment by identifying sites and informing the landowner.

The positive attitude of Maine's people toward conservation and wise use of the land has helped to create a positive climate for natural areas protection. Over the years the garden clubs in Maine and the New England Wildflower Society have increased the public awareness about rare plant conservation through a variety of educational services. Members of the Josselyn Botanical Society have also encouraged rare plant conservation. In addition, the work of The Nature Conservancy and Maine Coast Heritage Trust has promoted the role of the private sector in protecting unusual pieces of land. The active work and programs of these organizations have been very complementary to the Critical Areas Program's effort.

CONSERVATION

A number of innovative approaches have been developed for rare plant conservation in Maine. Because Maine does not have a law protecting rare plant species, we have developed our conservation strategy around irrefutable scientific documentation and around working on a cooperative basis with the landowner. Central to the

program's success is the verification by field checking of the State's rare plant stations.

The documentation on rare plants that we have assembled with the help of Maine botanists is very powerful information. Planning reports and botanical fact sheets play a major role in transmitting the information from the scientific community to the landowner or conservation interests. Written in non-technical language, these reports usually convince the reader that a particular plant species is rare, and that the areas where it is found are worthy of conservation. The planning reports have been carefully prepared by recognized authorities, and are complete and comprehensive. No one has challenged the data or conclusions of planning reports and fact sheets. These reports are a major factor in the success of Maine's program.

The listing of natural areas on the Register of Critical Areas is a time-consuming process that culminates in official state recognition of an area's significance. Landowners are initially contacted by a letter regarding proposed areas. After land ownership is verified, the planning report, and a description and map of the critical area are mailed to the landowner. After some time, landowners are telephoned or visited by the Critical Areas Program staff to discuss the rare plant species and proposed critical area. An eleven member Critical Areas Advisory Board appointed by the governor reviews the planning report, botanical fact sheets, and related documentation on each area before voting to officially register an area as a critical area. Once an area is registered, landowners are sent a copy of *The Landowner's Option*, jointly prepared by the Maine Coast Heritage Trust and Critical Areas Program. This booklet outlines the variety of land conservation techniques that can be used in Maine.

An overwhelming majority of landowners contacted by the Critical Areas Program support the designation and conservation of rare plant areas. Many people are intrigued by the presence of rare plants on their property, and greatly appreciate the scientific documentation provided by the program. A few landowners are apathetic to protection of rare plants. However, most are pleased and proud to own these areas and many have indicated they will not destroy the areas now that they know of their significance. Such positive response indicates that this approach of voluntary cooperation is an effective conservation technique.

A few landowners have even taken additional action to protect

rare plant areas as a result of being contacted by the Critical Areas Program. Upon learning about a very significant old growth white oak forest on their property, landowners in York decided to terminate a pending sale of a portion of the land. The major owners of the Sand Pond Rare Plant Area in Sanford were prompted to offer a donation of the land to a conservation organization.

In 1978, The Nature Conservancy, which works closely with the Critical Areas Program, acquired two rare plant areas in Maine. It purchased 1541 acres of Great Wass Island in Washington County as the result of a major effort to identify and acquire a nationally significant natural area in Maine. Great Wass Island supports a diversity of unusual plant communities and rare plant species, described later in this paper.

The second Nature Conservancy acquisition is the only known Maine station for *Iris prismatica* (Slender blue flag), in Wells, York County, which was registered as a critical area in May 1977. The United States Fish and Wildlife Service had been trying to acquire this strip of salt marsh land as an addition to an existing wildlife refuge. The Critical Areas designation acted as a catalyst and prompted the landowner to donate the land in a bargain sale to The Nature Conservancy, which in turn will transfer it to the United States Fish and Wildlife Service.

In the future, more landowners may offer significant rare plant areas to private conservation organizations or government agencies. As rare plant areas become available, organizations and agencies dedicated to botanical conservation should be prepared to acquire and manage them. In some cases, areas will have to be purchased, and these organizations will have to be prepared to finance the protection of the area.

The Critical Areas Program annually monitors the status of critical areas by sending a letter and prepaid return questionnaire to the landowner inquiring about the status of the rare plant area. The response has indicated that a number of critical areas have changed ownership; in most cases the sellers neglected to inform the buyers about the critical area. Thus, a new task for the program is to inform the new owners about the significance of the recently acquired land.

During the four years of the Critical Areas Program, identification and registration have not created adverse publicity about rare

plant areas. While almost all landowners have expressed fears of increased publicity, no landowners have actually complained about receiving any adverse publicity as a result of critical area designation. We do not know of any case where a rare plant locality has been threatened as a result of critical areas designation. While publicity is a natural concern, it has not materialized as a problem.

By maintaining close contact with landowners the program is able to ascertain which areas are threatened by physical destruction. Only a few rare plant areas are threatened by construction or harvesting of natural resources. The vast majority of botanical critical areas are not threatened by destruction because they are in isolated areas such as mountain tops, steep rocky cliffs, ravines, and riverbanks. In addition, the slow pace of the Maine economy has had a protective effect on many areas.

Technical advice regarding critical area management is one service that needs to be provided to landowners. A number of rare plant area owners, both public and private, have requested advice on how to manage their land to best maintain healthy rare plant populations or old growth forests. The program was able, for example, to arrange for a State forester to write a management plan for a 250 year old white pine stand owned and maintained by the Norway Nature Club. In general, however, technical information on both general management techniques and strategies for certain species is still needed.

Natural area identification programs are also useful to scientists studying plant distribution and the biology of rare species. Maine's program has received several recent requests from biologists for precise site data, which it was able to provide easily. In addition, the comprehensive planning reports are often requested by students and scientists, as well as planning agencies, conservation organizations, libraries, and interested citizens. Active exchange of data with the scientific community should promote more research and a better understanding of our rare plant species.

In order to increase the general public's awareness of a few of Maine's outstanding rare plant species, general reports, usually based upon the planning reports, have been prepared in a brochure format. Brochures have been prepared on orchids, *Kalmia latifolia* (Mountain Laurel), *Rhododendron maximum* (Great Rhododendron), and several uncommon tree species.

INVENTORY

The program has developed a rigorous and systematic inventory process to identify the rare species in the State of Maine. The first task was the development of a list of rare vascular plant species of at least state significance. In 1975, the Center for Natural Areas compiled the first listing of Maine rare plants in the report, *A Preliminary Listing of Noteworthy Natural Features in Maine* for the Critical Areas Program (Adamus and Clough, 1976). The center consulted with Dr. A. E. Brower, Dr. Charles Richards, Dr. George Rossbach, and Mr. L. M. Eastman, all of whom are active botanists with a working knowledge of Maine flora. The *Revised Check-List of the Vascular Plants of Maine* (Bean et al, 1966), and *The Flora of New England* (Seymour, 1969) were also useful in determining which species should be placed on Maine's rare plant list.

The Center's list, which included 233 species, has been updated several times. L.M. Eastman (1978a) added 16 species, and other additions are being considered based upon recent data from active Maine botanists, including the list of rare Maine plants compiled by L.M. Eastman (1978b) for the United States Fish and Wildlife Service. As the program's inventory brings additional information to light, the working rare plant list will be further revised.

In addition to rare species, the program also searches for unusual plant communities such as alpine-tundra, sand dune, and peatland communities. Dr. Ian Worley of the University of Vermont has prepared a classification of the types of peatlands found in Maine, and has also initiated an inventory of some of the peatlands. Finally, the program also inventories and identifies outstanding areas of common species such as old growth white pine, red spruce, and northern hardwood tree species.

A crucial element in the success of the program's inventory is coordination with botanical inventory work occurring independently throughout the state. The program has drawn heavily, for example, on C.S. Campbell's and L.M. Eastman's recent inventory of the Oxford County flora (Campbell, 1975; Campbell & Eastman, 1978), as well on extensive field work conducted by Eastman, particularly in the southern part of the state. The program also coordinated its inventory of some of the northern elements of Maine's flora with work done by the Army Corps of Engineers in the St. John River area. However, without a systematic, comprehensive,

and up-to-date documentation of Maine's flora, the program must also rely on its own resources.

A major difficulty of the rare plant inventory is the lack of recent locational data for many of the state's rare plants. One-hundred thirty-five of Maine's rare plant species have been collected from less than five locations, often at least fifty years ago, and the locational information on the herbarium label is usually limited to county and town. In only a few cases are the collectors still alive, and even then, they may not be able to recall the exact location. In quite a few cases, however, these shortcomings can be overcome by botanical detective work, especially by contact with locally active naturalists.

After selecting certain species for consideration, the program hires Maine botanists to ground check reported areas and to verify the species' presence. After completing their field work, they submit locational data, detailed site maps, a description, and photographs of the area to the Critical Areas Program staff; this material serves as the basis for the Program's documentation of the area.

The official documentation of rare plant areas has, in the past, been based on planning reports prepared by the botanists who conduct the fieldwork. Each report synthesizes all of the pertinent information on a species in Maine, and includes a description of the species, its life history, biology and ecology, and, if applicable, historical background. It also describes the inventory methodology, lists and describes the locations at which it has been found, and recommends significant stations for evaluation as critical areas.

The planning report is often the only up-to-date comprehensive report on the species in Maine or the New England region. As such, it enables the program to select areas which are particularly worthy of conservation.

The planning report system is best suited to **1**) those species for which a large amount of background material is available (e.g. *Kalmia latifolia*) or **2**) those species for which management is especially critical, e.g. those considered endangered or threatened at the federal level (e.g. *Cardamine Longii*). However, their expense in both time and money makes them impractical for many of Maine's rare plant species which are relatively unknown and which occur in only a few locations. To improve the efficiency and effectiveness of the rare plant inventory, a revised methodology has been adopted, elim-

inating the planning reports for many species and concentrating instead on obtaining accurate and complete locational information (Gawler, 1978).

A cornerstone of the revised system is a compilation of all New England herbaria records for the rare plant species (Eastman, 1978a) which gives locality information on 214 species. The program selects localities from this report, and attempts to relocate these historical localities. As stations for these species are found, the documentation formerly provided by the planning report is condensed into a botanical fact sheet for each species which includes an illustrated technical description, a general description, historical localities and localities which have been verified. As the inventory becomes more complete, the fact sheet can easily be amended to include new locations.

The Critical Areas Program's botanical inventory thus now proceeds on two levels: for those species for which a limited amount of information is available and which are reported from less than 15 locations, the fact sheet approach provides accurate, adequate, and efficient documentation; while for rare species reported from more than 15 locations or for which a greater amount of information is warranted, planning reports may be required for complete documentation (Gawler, 1978).

The inventory work that remains will be the most difficult, since most of the species yet to be located have been reported from obscure, poorly defined areas. Furthermore, many of the collections were made 50 to 100 years ago and rare plant stations of that time may not now exist, due to ecological changes or residential and commercial development.

RESULTS OF THE BOTANICAL INVENTORY

As of May 1979, the program had verified and described 136 significant plant or old growth forest areas. Thirty-three planning reports (PR) and 36 fact sheets (FS) have been completed for the following species: *Dasya baillouviana* (PR), *Schistostega pennata* (PR), *Lycopodium Selago* (FS), *Adiantum pedatum* var. *aleuticum* (FS), *Cryptogramma Stelleri* (PR), *Dryopteris fragrans* var. *remotiuscula* (FS), *Dryopteris Goldiana* (FS), *Polystichum Braunii* (FS), *Woodsia alpina* (FS), *Woodsia glabella* (FS), *Chamaecyparis thyoides* (PR), *Pinus Strobus* (old growth) (PR), *Phleum alpinum*

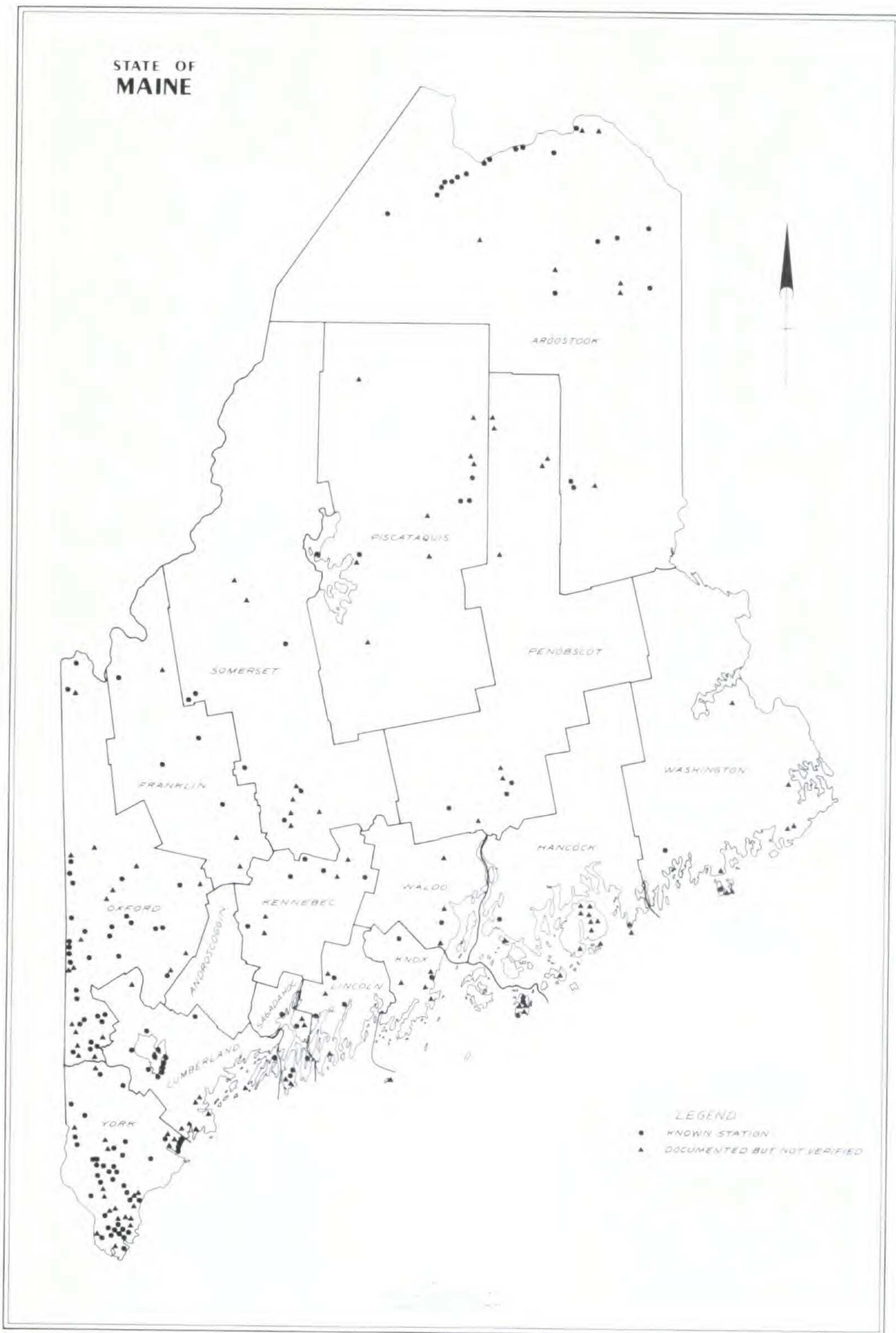


Figure 1. Critical Areas Program's Rare Plant Stations

(FS), *Carex eburnea* (FS), *Carex media* (FS), *Eleocharis tuberculosa* (FS), *Hemicarpha micrantha* (FS), *Peltandra virginica* (FS), *Xyris Congdoni* (FS), *Juncus trifidus* (FS), *Tofieldia glutinosa* (FS), *Iris prismatica* (PR), *Arethusa bulbosa* (FS), *Calypso bulbosa* (FS), *Cypripedium arietinum* (PR), *Habenaria leucophaea* (PR), *Isotria medeoloides* (PR), *Listera auriculata* (PR), *Orchis rotundifolia* (PR), *Triphora trianthophora* (PR), *Salix candida* (FS), *Salix interior* var. *exterior* (FS), *Carya ovata* (old growth) (PR), *Quercus alba* (old growth) (PR), *Quercus coccinea* (PR), *Quercus Prinus* (PR), *Arenaria groenlandica* (FS), *Nelumbo lutea* (FS), *Nuphar microphyllum* (FS), *Anemone multifida* (PR), *Clematis verticillaris* (FS), *Ranunculus lapponicus* (FS), *Lindera benzoin* (PR), *Sassafras albidum* (PR), *Cardamine Longii* (PR), *Draba arabisans* (FS), *Parnassia glauca* (FS), *Saxifraga Aizoön* var. *neogaea* (FS), *Amelanchier gaspensis* (FS), *Oxytropis johannensis* (PR), *Ilex glabra* (PR), *Impatiens pallida* (FS), *Ceanothus americanus* (PR), *Sheperdia canadensis* (PR), *Nyssa sylvatica* (PR), *Panax quinquefolius* (PR), *Cornus florida* (PR), *Chimaphila maculata* (PR), *Kalmia latifolia* (PR), *Rhododendron maximum* (PR), *Rhododendron viscosum* (PR), *Castilleja septentrionalis* (PR), *Pedicularis Furbishiae* (PR), *Lonicera oblongifolia* (FS), *Valeriana uliginosa* (FS), *Lobelia Kalmii* (FS), *Antennaria rupicola* (FS), *Prenanthes Bootii* (FS). The program has officially designated seventy-four botanical critical areas covering 2,463 acres. The remaining 62 areas are currently being described and mapped in detail as part of the official designation process. The program has relatively detailed locality data on another 122 areas, and is currently working towards relocating these stations. Additional localities are expected to come to light as work progresses.

The critical areas for rare plants are found in the floristically rich areas which are also the areas which have been heavily botanized (Figure 1). Many areas of Maine, such as the northwestern part of the State, have not been explored for rare species. A few areas have been botanized but have few rare plants found there. Hill's survey of the Penobscot Bay area (Hill 1919, 1923), and Rand's survey of Mount Desert Island (Rand & Redfield, 1894) found few rare plant stations. The recent field work by Campbell and Eastman in Oxford County, and Eastman in York County, has resulted in the discovery of a number of new rare plant stations. Older collections by M.L.

Fernald, Kate Furbish, J.C. Parlin, R.C. Bean, A.H. Norton, and G.D. Chamberlain have been very helpful in relocating areas.

Of the 136 known rare plant stations, the majority (74) are significant because of a single rare species. Sixty-two areas harbor more than one rare species. In addition, many of these areas are outstanding examples of different plant communities found in Maine.

To illustrate the current results of the botanical inventory, descriptions of ten areas and two regions which have been documented by the program follow. The selection of areas is necessarily subjective, and the descriptions are meant to serve only as examples of what the program considers Maine's most notable botanical areas. The examples were chosen also to represent the diversity of unusual habitats found in Maine: northern calcareous bogs, arctic-alpine vegetation, coastal vegetation, rich woods, riverbank communities, and communities of southern affinities. These exemplary rare plant stations display a broad geographical and ecological diversity; they are here arranged from south to north.

Rare Plant Stations in York County. The numerous rare plant areas in York County (Figure 1) are representative of the southern element of Maine's flora. Many of the species found at these areas are relatively common elsewhere but are considered rare in Maine because they are at the northern periphery of their range. *Quercus Prinus* (Chestnut Oak) for example, is known from but one Maine station. *Q. alba* (White Oak) and *Carya ovata* (Hickory), on the other hand, are relatively frequent in York County but occur few other places in Maine; thus some of the largest York County stands are significant. Three of the four known stands of *Sassafras albidum*, rare in Maine but very common throughout much of its range, occur in York County. *Kalmia latifolia* (Mountain Laurel) and *Rhododendron maximum* (Great Rhododendron) also reach their northern limit in Maine, with significant stands in York County. Maine's one naturally occurring specimen of *Cornus florida* (Flowering Dogwood) is found on Mt. Agamenticus. Other southern species contributing to the uniqueness of the York County flora include *Nyssa sylvatica* (Black Gum), *Ceanothus americanus* (New Jersey Tea), *Iris prismatica* (Slender Blue Flag), *Ilex laevigata* (Smooth Winterberry), *Lindera benzoin* (Spicebush), *Clethra alnifolia* (Sweet Pepperbush), *Peltandra virginica* (Tuckahoe), *Saxifraga pensylvan-*

ica (Swamp Saxifrage), and *Liatris borealis* (Northern Blazing Star). In addition to these known southern species, several others have been collected in the past but have not been recently seen. These include *Lespedeza hirta* (Hairy Bush Clover), *Baptisia tinctoria* (Wild Indigo), *Verbena urticifolia* (White Vervain), and *Sericocarpus asteroides* (Northern White Topped Aster). These species serve as indicators of southern plant communities which are infrequent in Maine. These communities, as well as the species themselves, are considered by the program to be significant.

Seawall Beach, Small Point, Sagadahoc County. Seawall Beach is one of the most outstanding of several significant sand dune plant communities along the Maine coast. The significance of this sand beach system was documented by the planning report on the geological and botanical aspects of sand beaches (Nelson & Fink, 1978). The extensive backdune area of this beach is made up of high parabolic dunes which support species such as *Ammophila breviligulata* (American Beachgrass) and *Hudsonia tomentosa* (Beach Heather) along with the common *Myrica pensylvanica* (Bayberry), *Lathyrus japonicus* (Beach Pea), *Cakile edulenta* (Sea Rocket), and *Artemisia Stelleriana* (Dusty Miller). The extensive coverage of *Hudsonia*, one of the largest areas in the State, and the occurrence of *Geaster hygrometricus* (Earthstar Puffball) at the northern limit of its range are especially notable. Also distinctive is the vegetational pattern — a mosaic resulting from the hummocky topography, rather than the more typical zonal pattern. Successional patterns and different successional stages may be observed here, as may the response of dune species to sand accretion and deflation processes. Because of its outstanding geological and botanical features, Seawall Beach was registered in July 1978. Furthermore, the landowners have promoted conservation of the area by granting a conservation easement to The Nature Conservancy.

Rattlesnake Mountain, Oxford County. This area is one of several outstanding rare plant areas which have come to light as a result of recent botanical work in the State. It was discovered by L.M. Eastman in 1974, and is currently a candidate critical area. On moist calcareous ledges above the southern hardwood slope of the mountain are found several rare species, many of them disjunct populations. *Ceanothus americanus* (New Jersey Tea), for example, is

found here and at only one other location in the State. The mountain is the only known Maine station for *Ranunculus fascicularis* (Early Buttercup), and one of two known Maine stations for *Vitis aestivalis* var. *argentifolia* (Summer Grape) and *Arabis missouriensis* (Missouri Rock-Cress). Several other unusual species, such as *Asplenium trichomanes* (Maidenhair Spleenwort) and *Goodyera pubescens* (Downy Rattlesnake Plantain), occur here as well. The diversity and rarity of the plant species found here make Rattlesnake Mountain a botanically unique area (Eastman, 1977).

Great Wass Island, Washington County. A large island near Jonesport, Great Wass Island exemplifies the vegetation of the eastern Maine coast, but is noteworthy for its unique complex of three distinctly different peatlands, a large stand of *Pinus Banksiana* (Jack Pine), and several rare plant species. Most unusual are three maritime species which are found primarily on the eastern coast of Canada, and which reach their southern limit in Maine. *Iris Hookeri* (Hooker's Iris), reported from 20 locations in Maine and as far south as Knox County; *Lomatogonium rotatum* (Marsh Felwort), which, in Maine, has been collected only at two locations, both in Washington County; and *Primula laurentiana* (Bird's-eye Primrose), reported from five locations in Washington County, seven locations in Aroostook County, and one station (which could not be relocated recently) in Piscataquis County (Pike, 1963). In addition, the Great Wass Heath supports other rare plant species, including *Arethusa bulbosa* and *Rubus chamaemorus* (Baked Appleberry). As more complete locational information becomes available, portions of Great Wass Island will be considered for designation as critical areas. In 1978, The Nature Conservancy purchased 1541 acres of Great Wass Island as a nature preserve.

Norridgewock Rare Plant Station, Somerset County. This is a rich deciduous woods area on the bank of the Kennebec River. It is most important as one of three Maine locations for *Cypripedium arietinum* (Ram's-Head Lady Slipper), listed as threatened by the Smithsonian Institution, especially as it is the northernmost natural stand in North America (Brower, 1977). This species has been known from here since 1959. *Chimaphila maculata* (Spotted Wintergreen) also occurs here, at the northern limit of its range; this species is known from only three other areas in the State (Eastman, 1976).

Also found here are *Orchis spectabilis* (Showy Orchis), *Habenaria Hookeri* (Hooker's Orchid), and a wide array of spring wildflowers including *Sanguinaria canadensis* (Bloodroot), *Hepatica americana*, and *Aquilegia canadensis* (Columbine). A small stream running through the lower part of the woods supports a wide diversity of ferns. The Norridgewock Rare Plant Station was registered as a critical area in 1977.

Twin Peaks, Oxford County. Twin Peaks is another noteworthy rare plant area which has come to light as a result of recent extensive botanical work in Oxford County. This remote mountain was first explored by C.S. Campbell and L.M. Eastman in 1974, who found the entire area botanically unusual because of its high elevation and the presence of Serpentine outcrops (Campbell & Eastman, 1978). Sites of especial interest are two cliff areas on the eastern side of the mountain. The lower of these, at 2600 feet, is a wet, calcic cliff covered with mosses and liverworts, where *Woodsia glabella* (Smooth Woodsia), *Woodsia alpina* (Alpine Woodsia), *Cystopteris bulbifera* (Bulblet Fern) and other ferns occur, as well as three very rare sedges: *Carex capillaris* var. *major*, *C. atratiformis*, and *C. media*. At the summit a dry cliff supports other calciphiles: *Lycopodium Selago* (Alpine Clubmoss), *Dryopteris fragrans* var. *remotiuscula* (Fragrant Fern), *Poa glauca*, *Carex eburnea*, *Saxifraga Aizoön* var. *neogaea* (Livelong Saxifrage), and *Antennaria rupicola* (Smaller Cat's Foot). The latter three species are particularly significant, being well beyond their previously known range here. Twin Peaks was designated as a critical area in April 1979.

Mt. Katahdin, Piscataquis County. Katahdin, Maine's highest mountain, has long been regarded as one of the most, if not the most, significant natural features of the state. Botanical work on Katahdin in the late 1800's and early 1900's established the distinctive character of the mountain; during this time, 32 vascular species now considered rare in Maine were collected from the mountain, 11 of which have been found in Maine only on Mt. Katahdin (Fernald, 1901). More recently, in 1976, an inventory of the part of the mountain above treeline was conducted by Diane Ebert May and Dr. Ronald Davis (1978), which focused on the alpine-tundra communities rather than on specific rare species. Eleven of the thirty-two rare species originally found on the mountain were relocated in the

course of this study, including five which are known in Maine only from Mt. Katahdin: *Arctostaphylos alpina* (Alpine Bearberry), *Casiope hypnoides* (Moss Plant), *Loiseleuria procumbens* (Alpine Azalea), *Phyllodoce caerulea* (Mountain-Heath), and *Rhododendron lapponicum* (Lapland Rosebay). Other recent work has uncovered stations for *Saxifraga stellaris* var. *comosa* (Star Saxifrage), its only known location in Maine, as well as *Saxifraga Aizoön* var. *neogaea* (Livelong Saxifrage) and *Viburnum edule* (Mooseberry). However, many of the rarities originally reported have not been recently relocated, including nine species known in Maine only from Mt. Katahdin: *Carex katahdinensis*, *C. mainensis*, *Luzula spicata* (Alpine Woodrush), *L. confusa* (Northern Woodrush), *Polygonum viviparum* (Alpine Knotweed), *Epilobium alpinum* and *E. anagallidifolium* (Willow-Herb spp.), *Euphrasia Oakesii* (Oakes' Eyebright), and *Gnaphalium supinum* (Alpine Cudweed). Two other species, *Carex saxatilis* and *Cardamine bellidifolia* (Alpine Cress), are known from only one other Maine station, and have not been recently found at either location. In the near future the program hopes to relocate stations of these rare species. In a more general sense, Katahdin is noteworthy because of the many types of alpine-tundra plant communities and the overall extensive coverage of alpine-tundra vegetation.

Crystal Bog, Aroostook County. Crystal Bog has been known as one of the most interesting botanical areas in Maine since the turn of the century, when M.L. Fernald and others studied and described its flora (Fernald and Weigand, 1910). Also known as Thousand Acre Bog, the extensive peatland includes acid bogs and calcareous fens.

Botanical interest in the area has been rekindled of late, partially due to the gift of most of the bog to The Nature Conservancy by the J.M. Huber Corporation. As part of this recent work, the several distinct floristic regions of the bog have been described and mapped (Davis & Sawyer, 1978), and documentation of the rare plant species of the bog is being brought up to date. The rediscovery of the only Maine station of *Drosera linearis* (Linear-Leaf Sundew) here, for example, was the culmination of intensive and extended search (Rooney et al, 1978). Another rare species, *Habenaria leucophaea*, has been known from Crystal Bog since at least 1906, but its population has apparently never been extensive or stable. Fernald first

described it from a fen on what is now Nature Conservancy property (Fernald and Weigand, 1910), but all recent sightings of this species have been in the fen in the small part of the bog which is privately owned. Also known from the bog are *Tofieldia glutinosa* (False asphodel), *Arethusa bulbosa*, *Parnassia glauca* (Grass of Parnassus), *Lonicera oblongifolia* (Swamp Fly-honeysuckle), *Valeriana uliginosa* (Northern Valerian), and *Lobelia Kalmii* (Brook Lobelia). Another rare species, *Juncus stygius* var. *americanus*, collected at Crystal Bog in 1907, has not been recently found. Crystal Bog is significant both in overall character and in the number of rare and unusual species which occur there.

The St. John River Region, Aroostook County. Botanical interest in the St. John River, long renowned for the many rare plant species found along its shores, has recently been revived as a result of the proposed Dickey-Lincoln hydroelectric power project. *Pedicularis Furbishiae* (Furbish's lousewort), endemic to the river and, until recently, believed extinct, was rediscovered in 1976 by Dr. Charles D. Richards of the University of Maine at Orono, growing along the banks of the river at six locations, all within the township of Allagash. It has since been found at twelve other stations along the St. John River. Also endemic to the river valley is *Carex Josselynii* (Josselyn's Sedge), collected in the past between St. Francis and Fort Kent; recent searches for this sedge have proven fruitless. *Astragalus Blakei* (Blake's Milk-Vetch), while not endemic to the St. John River, is very rare, being restricted to cliffs and talus of northern Maine and northern Vermont. In Maine, it was last collected in 1939, and was not seen in Dr. Richards' 1976 survey. Although these three species are by far the rarest of the St. John plants, the river supports a remarkable assemblage of arctic and boreal species, here at the southern limit of their range. The most frequently encountered of these rare species are *Astragalus alpinus* var. *brunetianus* (Alpine Milk Vetch) and *Tanacetum huronense* var. *johannense* (Huron Tansy), which occur along the lower shores of the river from Allagash to Frenchville, often together. Less commonly found are *Castilleja septentrionalis* (Northern Painted Cup), *Anemone mutifida* (Cut-leaved anemone), *Oxytropis johannensis* (Field Oxytrope), *Primula mistassinica* (Bird's-eye Primrose), *Juncus alpinus* and *J. alpinus* var. *rariflorus* (Alpine Rush), and *Hedysarum alpinum* var. *americanum* (Sweet-Broom). Several other northern species, more

widely distributed in Maine than the preceding, but still rare, are found along the river as well. These include *Parnassia glauca* (Grass-of-Parnassus), *Tofieldia glutinosa* (False Asphodel), *Lobelia Kalmii* (Brook Lobelia), *Arnica mollis* (Hairy Arnica), and *Allium schoenoprasum* var. *sibiricum* (Wild Chive). With the wide diversity of rare and unusual plant species found along its banks, the St. John River is truly a unique botanical area.

FUTURE BOTANICAL ACTIVITIES

The program will continue to search for the rare species not yet located. As the efforts of the program become better known, we hope that botanists and naturalists unfamiliar with the program will cooperate with our inventory. Much hard detective work remains to be done to relocate formerly known stations. In addition, more general inventory work needs to be carried out in regions where there is a very poor data base for rare plants (Figure 1). In 1979, several areas that will qualify as critical areas were reported to the program by interested landowners, a trend which we hope will continue.

Conservation activities for known rare plant areas will increase as more people become concerned about maintaining the areas to protect the plants. The program's staff will continue to monitor the status of rare plant critical areas. Management guidelines will need to be prepared for some species. Autecological studies of rare species should be undertaken to increase our understanding of their ecology and reproduction. The program stands ready to assist botanists and landowners who would like to increase their knowledge of Maine's rare plants.

Land conservation will play an increasing role in the long term protection of some areas. Conservation interests should be prepared to purchase significant areas without delay if threatened areas are offered for sale. However, because of the large number of privately owned areas, the program will have to depend very heavily upon continued cooperation from the private landowners to protect their rare plant stations.

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